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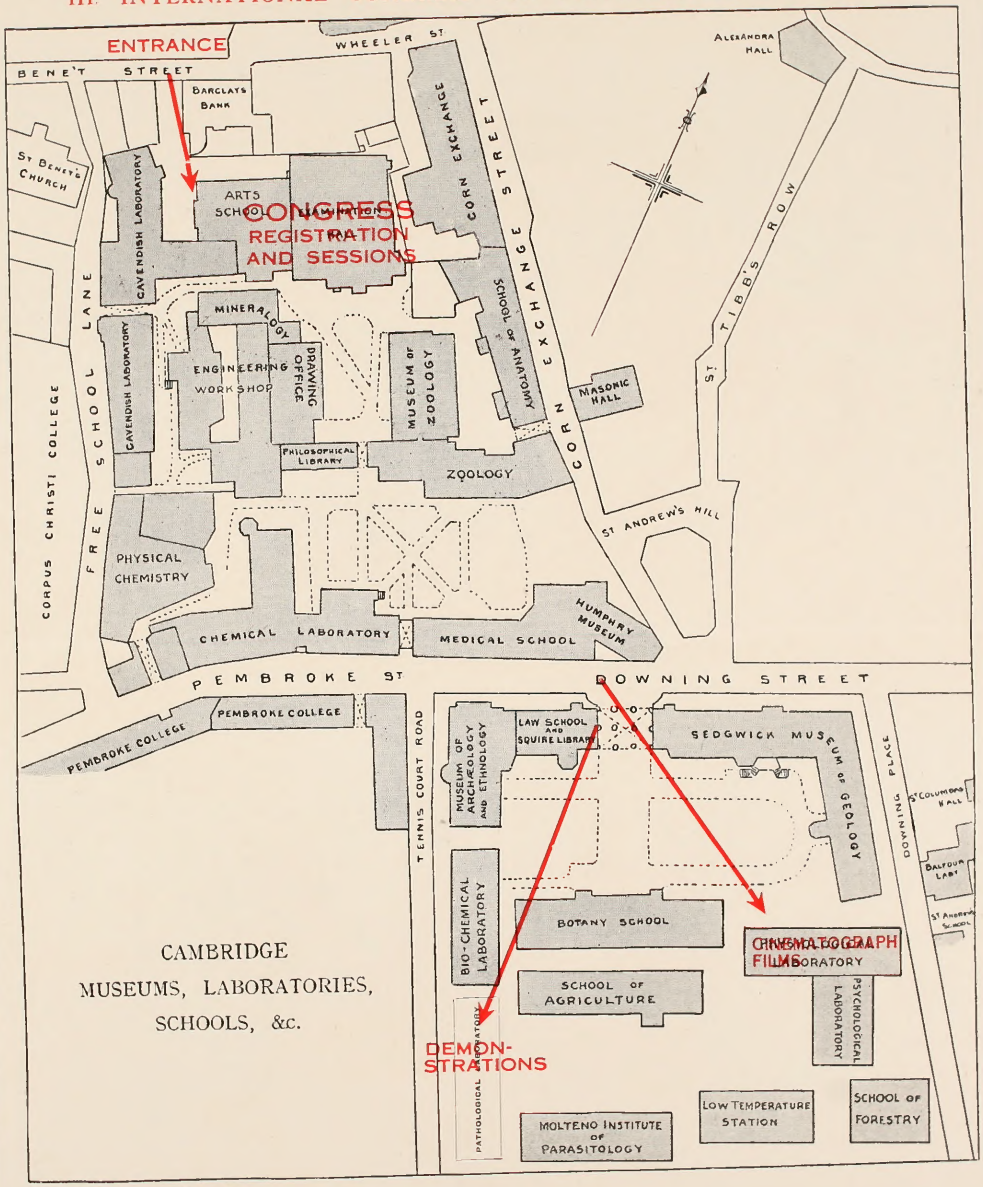
III. INTERNATIONAL CONGRESS FOR EXPERIMENTAL CYTOLOGY



CAMBRIDGE
MUSEUMS, LABORATORIES,
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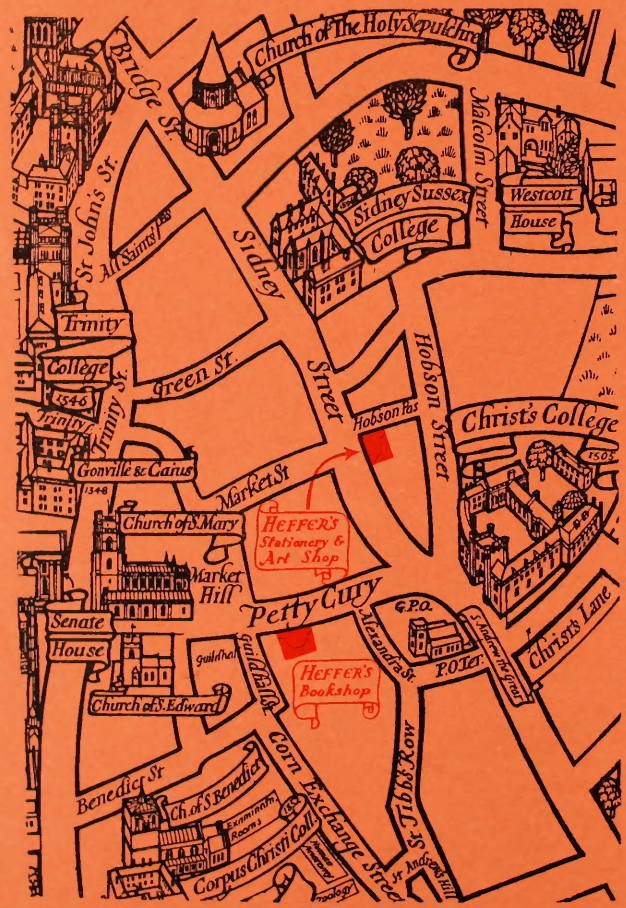
THIRD INTERNATIONAL CONGRESS
FOR EXPERIMENTAL CYTOLOGY

CONGRESS HANDBOOK

CAMBRIDGE
1933



THIRD INTERNATIONAL CONGRESS FOR EXPERIMENTAL CYTOLOGY

CONGRESS HANDBOOK

CAMBRIDGE
1933

CONTENTS

Third International Congress for Experimental Cytology

CAMBRIDGE - AUGUST 21—26, 1933

International President

Professor TH. HUZELLA, Budapest

Local President

Dr. JAMES GRAY

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Local Arrangements

By kind permission of the authorities the Headquarters and Reception Room of the Congress are in the Arts School of the University (entrance from Bene't Street).

The Reception Room (Examination Hall) will be open from 9 a.m. to 7 p.m. from August 21st to 26th inclusive.

Members should visit the Reception Room at intervals during the week to ascertain the latest particulars about the Congress arrangements and to collect correspondence, etc. Any changes in the programme will be notified in the Reception Room.

A temporary Post Office Letter Box is installed in the Reception Room, and arrangements have been made for members of the Congress to purchase stamps and writing material on the premises.

Congress Sessions will be held in the Arts School Lecture Theatre (entrance Bene't Street).

Demonstrations and any Evening Sessions of the Congress will be held in the Department of Pathology (entrance Downing Street), by kind permission of Professor H. R. Dean.

Cinema Films will be shown in the new Physiological Lecture Theatre (entrance Downing Street), by kind permission of Professor J. Barcroft.

For particulars of the Congress Photograph, see p. 14.

Foreign banking business can be transacted at Messrs. Barclays Bank, Bene't Street (adjacent to Reception Room). The bank is open daily 9 a.m.–3 p.m., Saturday 9 a.m.–12 noon.

Tea will be served each day (price 6d.) in the Department of Pathology at 4.0 p.m. from August 22nd to 26th inclusive.

NOTE. Formal evening dress will not be required at any of the social functions of the Congress.

Organisation Locale

Avec l'aimable permission des Autoritées Universitaire la salle de Rassemblée et la salle de Réception pour le Congrès seront situées dans "l'Arts School" de l'Université (l'entrée est située dans Bene't Street).

La salle de Réception (qui sera tenue dans "l'Examination Hall") sera ouverte de 9 hrs du matin à 19 hrs du soir à partir du 21 Aôut jusqu'au 26 Aôut inclusivement.

Les membres sont priés de se rendre périodiquement pendant la semaine à la salle de Réception pour s'y informer de tout changement ayant lieu concernant le Congrès et pour obtenir leur correspondance, etc. Tout changement de programme sera publié dans la salle de Réception.

Un bureau de poste special sera organisé dans la salle de Réception. Les membres du Congrès pourront y acheter des timbres et tout matériel pour écrire.

Les communications du Congrès auront lieu dans l'amphithéâtre de "l'Arts School" (l'entrée est située dans Bene't Street).

Les démonstrations et toutes les réunions du Congrès ayant lieu le soir seront tenues dans le "Department of Pathology," grâce à l'aimable permission du Professeur H. R. Dean (l'entrée est située dans Downing Street).

Les films cinématographiques seront montrés dans le nouvel amphithéâtre de Physiologie grâce à l'aimable permission du Professeur J. Barcroft (l'entrée est située dans Downing Street).

Pour tout détail concernant la photographie du Congrès voir à la page 14.

Un bureau d'èchange se trouve chez "Messrs. Barclay's Bank." La banque est à côté de la salle de Réception, l'entrée est située dans Bene't Street. Les heures de Banque sont de 9—15 hrs., Samedi 9 hrs.—midi.

Un thé sera servi tout les jours (prix 6d.) dans le "Department of Pathology," a 16 heures de l'après-midi à partir du 22 Aôut jusque'au 26 Aôut inclusivement.

N.B. Aucune des Réceptions du Congrès nécessiteront une tenue de soirée.

Lokale Anordnungen

Das Hauptquartier und Empfangszimmer des Kongresses sind mit gütiger Erlaubnis der Universitäts-Autoritäten in der "Arts School" und dem nebenan liegenden Prüfungssaal. (Eingang von Bene't Street).

Das Empfangszimmer (Prüfungssaal) wird von 9 Uhr morgens bis 7 Uhr abends vom 21. bis zum 26. August (einschl.) offen sein.

Während der Woche sollten die Mitglieder das Empfangszimmer von Zeit zu Zeit aufsuchen, um die letzten Anorduungen des Kongresses zu erfahren und etwaige Briefsachen abzuholen. Alle Änderungen im Programm werden dort angeschlagen werden.

Ein Briefkasten ist zeitweilig im Empfangzimmer angebracht, und Mitglieder des Kongresses können dort Briefmarken und Schreibmaterial kaufen.

Die Sitzungen des Kongresses werden in der "Arts School" (Eingang Bene't Street) gehalten werden.

Abend Sitzungen des Kongresses mit praktischen Erläuterungen werden mit gütiger Erlaubnis des Professor H. R. Dean in dem pathologischen Institut gehalten werden. (Eingang Downing Street).

Kino Films werden in dem neuen pathologischen Hörsaal gezeigt werden, mit gütiger Erlaubnis des Professors J. Barcroft. (Eingang Downing Street).

Alles Nähere über die Photographie des Kongresses, s. 14.

In Messrs. Barclay's Bank, Bene't Street, nebenan dem Empfangszimmer, können alle ausländischen Geldangelegenheiten besorgt werden. Die Bank ist täglich von 9 Uhr morgens bis 3 Uhr nachmittags geöffnet. Sonnabends von 9 bis 12 Uhr morgens.

Tee wird täglich (sechs pence) um 4 Uhr in dem pathologischen Institut serviert werden (vom 22 August bis zum 26 August einschl.).

N.B. Abendsanzug ist in keinen sozialen Versammlungen des Kongresses nötig.

SUMMARY OF PROGRAMME

MONDAY, AUGUST 21st.

9 a.m.—3 p.m.	Registration of Members (Reception Room).
3 p.m.	Opening Meeting of Congress (Large Examination Hall, Arts School).
	Speech by Local President (Dr. James Gray).
	Welcome to Members by Her Worship the Mayor of Cambridge.
	Presidential Address by Professor Th. Huzella.
	Tea (by invitation of Local Committee).
5 p.m.	General Business Meeting.
8.30 p.m.	Illustrated Lecture on Cambridge (Arts School Lecture Theatre).

TUESDAY, AUGUST 22nd.

9 a.m.—12.30 p.m.	Congress Session (Arts School).
12.30 p.m.	Official Photograph of Congress (Reception Room).
2—4 p.m.	Congress Session (Arts School).
4 p.m.	Tea Interval (Department of Pathology).
4.30—6.30 p.m.	Demonstrations (Department of Pathology).
10.0 a.m.	Conducted Tours of the Colleges for Associate Members and others (start from Reception Room).
8.15 p.m.	Evening Party at King's College (by invitation of Dr. and Mrs. Gray).

WEDNESDAY, AUGUST 23rd.

9 a.m.—12.30 p.m. 2—4 p.m.	Congress Sessions (Arts School).
4 p.m.	Tea Interval (Department of Pathology).
4.30—6.30 p.m.	Demonstrations (Department of Pathology).
8.30 p.m.	Cinematograph Films (Department of Physiology).
	Excursion—
9.30 a.m.	Tour to Ely and Sandringham (start from Downing Street).

THURSDAY, AUGUST 24th.

9 a.m.—12.30 p.m. 2—4 p.m.	Congress Sessions (Arts School).
4 p.m.	Tea Interval.
4.30—5.30 p.m.	Demonstrations (Department of Pathology).
5.30—6.30 p.m.	Cinematograph Films (Department of Physiology).
7.30 p.m.	Congress Dinner in Trinity College.
10.0 a.m.	Conducted Tours of the Colleges for Associate Members and others (start from Reception Room).
	Excursion—
2.15 p.m.	Half-day trip to Ely.

FRIDAY, AUGUST 25th.

9 a.m.—12.30 p.m. 2—4 p.m.	Congress Sessions (Arts School).
4 p.m.	Tea Interval.
4.30—6.30 p.m.	Demonstrations (Department of Pathology).
8.30 p.m.	Dance at Dorothy Café (Sidney Street).
	Excursion—
2.30 p.m.	Visit to Messrs. Chivers' Fruit Farms and Factory.

SATURDAY, AUGUST 26th.

10.15 a.m.—12.30 p.m. 2—4 p.m.	Congress Sessions (Arts School).
4 p.m.	Tea Interval.
4.30—6.30 p.m.	Demonstrations (Department of Pathology).

Daily Programme of Sessions

with Summaries of Papers

MONDAY, 21st AUGUST

IN EXAMINATION HALL, ARTS SCHOOL, BENE'T STREET.

3.0 p.m.

PRESIDENTIAL ADDRESS BY

PROFESSOR Th. HUZELLA (Budapest)

Subject : "Culture des tissues en ses relations aux problèmes générales de la biologie et aux problèmes spéciales de la medecine."

8.30 p.m.

IN LECTURE THEATRE, ARTS SCHOOL, BENE'T STREET.

ILLUSTRATED LECTURE ON *CAMBRIDGE* BY

P. C. FITZGERALD, ESQ., M.A.

TUESDAY, 22nd AUGUST

Morning Session 9.0 a.m.

Subject: Cell Respiration and Cell Metabolism.

Chairman: F. F. BLACKMAN (Cambridge).

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1. A. SZENT-GYÖRGYI, Szeged.

Non enzymic catalysts of cellular oxidation

"Ox-redox potential of the cell" has no meaning. The animal cell has points with potentials as widely different as one volt. The most positive places are those, at which O_2 is activated. The potential of these places is probably close to the potential of O_2. The most negative points are those, at which the H of the foodstuffs is activated. These potentials are identical with the potentials of the foodstuff, the free energy of which is not changed by the process of activation (Borsook, Wurmser, Szent-Györgyi). The enzymic catalysts of oxidation seem to have the sole function of overcoming the inertia of the system. This potential difference between activated foodstuff and activated O_2 (the underlying chemical affinity) is the source of animal oxidative energy.

The oxidation systems are complex and the drop of potential between Foodstuff and O_2 seems to take place in steps. The non-enzymic catalysts of oxidation can be classified according to their relation to this scale of potentials. Cytochrome, the vegetable polyphenol-quinone system, etc., are steps in this scale. There is no evidence as yet that the two known strongly electroactive reducing agents of the cell, glutathione and ascorbic acid, actually are steps in this energy change. At present it seems more likely that both bodies serve only as ox-redox buffers protecting protoplasm against oxidation. The thermodynamically irreversible nature of the oxidation of both these compounds suggests the same possibility. It cannot be excluded, however, that these substances also transfer energy from the main system of oxidation to minor systems.

Substances of the group of adenylic acid seem to play as coenzymes of dehydrogenation an important rôle in oxidation. Evidence is

accumulating, that these substances are involved in the transfer of the energy, liberated by oxidation. They might be also involved in the automatic regulation of oxidation, by which any excess is avoided.

Evidence is also accumulating that the oxidation processes catalysed by substances of the type of adenylic acid, consist of one single step, which is effected in reversible systems. This one step of oxidation is followed only by fermentative processes, by which carbohydrates are again restored. Lactic and hexosediphosphoric acid are oxidised in this system into pyruvic, oxybutyric acid into ketobutyric acid.

2. F. F. BLACKMAN, Cambridge.

Carbohydrates and Respiratory Metabolism in Plant Tissues

A survey of the major problems presented by the close connection of respiration with the general metabolism of the cell.

The interacting metabolic components of the system are (1) antecedent carbohydrate metabolism, (2) anaerobic fermentation and (3) oxidative respiration with its coupled anabolism.

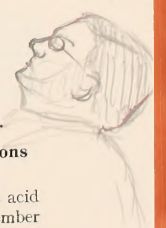
The first relation to be surveyed is the metabolic setting of respiration as part of the total of concurrent metabolism. All concurrent oxidative and reductive metabolism must distort the values of either O_2-intake or CO_2-production, which are used as quantitative indexes of respiratory activity.

The second relation concerns the close control of respiratory rate by the supply of carbohydrate metabolites.

Thirdly, a problem arises from the juxtaposition of fermentation and respiration. It has been possible by using low concentrations of oxygen to produce these two states, in alternation, for one and the same tissue; and thus to establish certain quantitative characteristics of the process of substitution.

3. M. DIXON, Cambridge.

Respiratory Inhibitors



4. KURT G. STERN and GUY D. GREVILLE, London.

A study of the action of lyochromes on certain oxidations of biological interest

Warburg's second oxidative catalyst from yeast and lactic acid bacteria ("das gelbe Oxydationsferment") is obviously a member of the lyochrome series, other members of which have been detected

in whey (Bleyer and Kallmann), heart-muscle (Szent-Györgyi), liver and plant seedlings (Stern), egg-white and various other sources (Kuhn, Ellinger). In an attempt to elucidate the function of the lyochromes present in the animal body, their physico-chemical and biological properties are being studied.

The urochrome fraction of urine contains either a lyochrome or a closely related substance. Our first experiments have been made on the so-called "purified urochrome fraction," of which relatively large amounts are conveniently prepared by adsorption on charcoal or Fuller's earth, desorption with acetic acid, and subsequent purification by fractional precipitation. The elementary analysis of the dried gummy product was C 30·9 per cent.; H 6·64 per cent.; N 13·19 per cent.; S 1·13 per cent. The molecular weight was found by diffusion experiments to be 2600. The preparation contained 2 per cent. glucuronic acid. The yellow-brown solution in water showed continuous absorption in the blue and a greenish-blue fluorescence on irradiation with ultra-violet rays. The toxicity is low.

Urochrome, which occurs in the urine also in the form of a chromogen, may be reduced *in vitro* to a slightly yellow body, the reoxidation of which to urochrome has not so far been accomplished.

It could be shown that the urochrome fraction converts with considerable speed crystalline horse hæmoglobin at pH 7·3 to methæmoglobin, and also crystalline rat hæmoglobin at pH 9·3 to alkaline methæmoglobin. Since it produces methæmoglobin from reduced hæmoglobin under strictly anærobic conditions, clearly urochrome acts here as an oxidant. Since the stimulation of respiration by methylene blue and pyocyanine has been referred by Warburg and Stern respectively to methæmoglobin-forming ability, we were led to investigate the effect of urochrome on respiratory processes. It has been found that the respiration of rabbit erythrocytes is increased nearly three times by urochrome in 5 m. concentration, an acceleration of the order of that produced by rat liver extracts (Michaelis and Salomon). Since it was found that liver lyochrome also produces methæmoglobin from oxyhæmoglobin, the effect of this substance on cell respiration is likewise being studied.

12.30. Official Photograph.

The Official Congress Photograph will be taken on the steps of the Reception Room, immediately after the morning session.

Afternoon Session 2.0 p.m.

5. M. STEPHENSON and L. H. STICKLAND, Cambridge.

The Bacterial Metabolism of Molecular Hydrogen

Most tissues are able to utilise combined hydrogen, and the majority of biological oxidations depend on this power; bacteria alone are able to use molecular hydrogen. Two enzymes so far discovered are concerned with the latter function:—

(1) Hydrogenase, catalysing the oxidation of hydrogen, and (2) hydrogenlyase catalysing its liberation. Thus three enzymes are concerned with the action of bacteria on formic acid:—

(1) Formic dehydrogenase catalysing the action

$$H{\cdot}COOH \rightleftharpoons 2H + CO_2.$$

(2) Formic hydrogenlyase, catalysing the action

$$H{\cdot}COOH \rightleftharpoons H_2 + CO_2.$$

(3) Hydrogenase, catalysing the action

$$H_2 \rightleftharpoons 2H.$$

The hydrogen of (1) and (3) can be transferred to oxygen or to any hydrogen acceptor. For instance, hydrogen can be transferred to sulphate giving hydrogen sulphide as previously shown by us in the case of a sulphate-reducing *vibrio*.

We have now obtained and isolated in pure culture an organism able to reduce the following 1-carbon compounds by molecular hydrogen with the production of methane.

$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$
$$CO + 3H_2 \rightarrow CH_4 + H_2O$$
$$H{\cdot}CHO + 2H_2 \rightarrow CH_4 + H_2O$$
$$CH_3{\cdot}OH + H_2 \rightarrow CH_4 + H_2O$$

The organism lives on formate as sole source of carbon and ammonium salts as source of nitrogen. The formate is decomposed according to the equation

$$4H{\cdot}COOH = CH_4 + 2H_2O + 3CO_2.$$

This reaction has been shown to be the work of two enzymes, viz. formic hydrogenlyase

$$H{\cdot}COOH = H_2 + CO_2$$

and hydrogenase

$$4H_2 + CO_2 = CH_4 + 2H_2O.$$

In the early stages of the reaction hydrogen and methane are present together; finally, methane only is present.

6. F. LIPMANN, Copenhagen.

Uber die Rolle der Glykolyse im Stoffwechsel embryonaler Zellen

7. J. H. QUASTEL, Cardiff.

Oxidation of Fatty Acids by the Liver

Liver slices bring about very high rates of oxidation of fatty acids (excluding formic acid). Fatty acids containing an even number of carbon atoms show extensive production of acetone. Those containing an odd number of carbon atoms show no appreciable acetone formation. The following are typical results for the respiration of liver (guinea pig).

Fatty acid (0·0166M.)	Qo_2	Acetone (nitroprusside test)
None	4·5	
Formic	4·5	
Acetic	7·4	+++
Propionic ..	10·0	—
Butyric	11·9	++++
Valeric	12·8	—
Caproic	13·6	++++
Heptylic ..	13·8	—
Caprylic	13·0	++++

With increase in concentration of the fatty acid, the Qo_2 (and acetone production) is lowered, this being specially marked with the higher members of the series. The addition of propionic acid to butyric acid markedly lowers the acetone production, probably by competitive action. The addition of glucose to the liver fails to influence the oxidation of butyric acid; hexose-monophosphate, however, appears to lower the acetone production though there is no evidence of an increased consumption of oxygen. Minced liver does not oxidise fatty acids.

Brain slices do not show an active oxidation of fatty acids or acetone production. Kidney slices oxidise fatty acids but show little or no acetone production.

8. H. LASER, Heidelberg.

Ueber den Stoffwechsel von Gewebekulturen unter besonderer Berücksichtigung der Anaerobiose

Eine manometrische Methode zur Messung des Stoffwechsels von Gewebekulturen während des Wachstums gestattet die Bestimmung der Stoffwechselgrössen Qo_2, $Q_M^{O_2}$ und $Q_M^{N_2}$ nach Warburg,

das heisst die Bestimmung des Sauerstoffverbrauchs sowie der Glykolyse in Sauerstoff und in Stickstoff.

Der Stoffwechsel wachsender normaler Hühnerfibroblasten *in vitro* gleicht dem von überlebendem Tumorgewebe. Bei relativ hoher, intakter Atmung besteht eine grosse aerobe Glykolyse. Desgleichen ist die anaerobe Glykolyse gross. Die untersuchten normalen Gewebe (Bindegewebe, Epithel und Leukocyten) können längere Zeit anaerob wachsen und leben. Bindegewebe weist anaerob (in N_2 oder mit Blausäure) innerhalb 4 bis 6 Tagen die gleiche Gewichtszunahme auf wie in Sauerstoff.

9. R. A. PETERS and H. M. SINCLAIR, Oxford.

Vitamin B_1 and Tissue Oxidation

In the polyneuritic symptoms arising from vitamin B_1 deficiency in the pigeon's brain, we have a specific disturbance of intermediary carbohydrate metabolism, which can be utilised to shed light upon the course of normal processes, just as is the case in diabetes. In the vitamin deficient brain there is found increased lactate content,[1] diminished oxygen uptake with glucose,[2] lactate[3] and pyruvate,[4] as compared with the normal; but normal and deficient tissue behave the same with succinate.[2] These changes are not due to the inanition,[2,5] but are the specific result of diminished amount of vitamin B_1 in the tissue; addition of vitamin B_1 crystals *in vitro*, in minute amounts, restores the normality (maximal results are reached with 0·000,03 per cent.),[6] and causes a rise of tissue R.Q. towards a carbohydrate value.[7] Interaction of lactate, vitamin B_1 and phosphorus compounds is essential for the maintenance of normal respiration.

[1] Kinnersley and Peters (1930), *Biochem. J.*, **24**, 710.
[2] Gavrilescu and Peters (1931), *Biochem. J.*, **25**, 1397 and 2150.
[3] Gavrilescu, Micklejohn, Passmore and Peters (1932), *Proc. Roy.S oc. B.*, **110**, 431.
[4] Micklejohn, Passmore and Peters (1932), *Biochem. J.*, **26**, 1872.
[5] Micklejohn, Passmore and Peters (1932), *Proc. Roy. Soc. B.*, **111**, 391.
[6] Passmore, Peters and Sinclair (1933), *Biochem. J.*, **27**, 842.
[7] Sinclair (1933), *J. Physiol. Proc.* (in press).

10. JEAN BRACHET, Bruxelles.

Le Metabolisme de l'oeuf de Grenouille pendant la Mitose

Les auteurs qui se sont attachés à suivre l'intensité du métabolisme respiratoire au cours de la mitose chez l'oeuf d'Oursin ont abouti à des conclusions contradictoires: alors que Lyon et Vlès

ont mis en évidence une élimination rythmique de CO^2 en rapport avec le cycle mitotique, Gray et Pei-Sun-Tang ont constaté, sur le même matériel, que la consommation d'O^2 augmentait pendant cette période avec une régularité parfaite.

Le synchronisme souvent remarquable des divisions chez l'oeuf de Grenouille en fait un matériel de choix pour les recherches de ce genre; la consommation d'O^2 des oeufs dégangués aux ciseaux était mesurée de 5 en 5' à l'aide du microrespiromètre de Fenn et de 10 en 10' au manomètre de Warburg.

Dans *toutes* les expériences (30 en tout), *l'apparition des sillons a coïncidé avec un relèvement marqué du taux des oxydations* jusqu'au stade VIII blastomères. Un second clocher, un peu moins marqué, est intercalé entre les plasmodiérèses et paraît correspondre à l'anaphase.

Lorsque le synchronisme entre les mitoses était peu satisfaisant ou lorsqu'on mesurait la respiration d'oeufs vierges ou de gastrulas, les graphiques obtenus ne présentaient guère d'oscillations. Il semble donc bien que l'aspect cyclique caractéristique de la courbe des oeufs en voie de segmentation n'est pas le fait d'erreurs d'expérience, mais qu'il correspond à des modifications rythmiques du métabolisme en rapport avec les diverses phases de la mitose.

11. R. MEIER, Leipzig.

Ueber den Einfluss von Bakteriengiften auf Isolierte Zellen und Gewebe

Die isolierte Zelle zeigt gegenüber der Einwirkung von Bakterien eine weit grössere Mannigfaltigkeit der Reaktionsmöglichkeiten als bei chemisch definierten Giften. Abhängig von Zellart und Bakterienart, ist zwischen der Anregung der spezifischen Zelltätigkeit und der hochgradigen Schädigung eine Reihe nach Art und Menge abgestufter Wirkungen erkennbar. Die Wirkung des lebenden Bakteriums setzt sich aus einer Beeinflussung der Zelle durch toxische Produkte und einer Beeinflussung des Lebensmilieus der Zelle zusammen. Bei Vergleich von Wirkungen auf Stoffwechsel und Wachstum ist es wahrscheinlich, dass der primäre Angriffsort nicht an bekannten Stoffwechselprozessen zu suchen ist, sondern dass diese sekundär von anderen Störungen des Zellebens beeinflusst werden. Für das Verstehen krankhafter Zellprozesse erscheint es auf Grund dieser Feststellungen notwendig, zur Analyse einer Einwirkung sich nicht damit zu begnügen, leicht erfassbare Veränderungen des Stoffwechsels als Charakteristikum dieser Wirkung anzusehen, sondern bei der wachsenden Zelle nach

Veränderungen des Wachstums und der Regeneration zu suchen, die nicht ohne weiteres als Stoffwechselveränderungen feststellbar sind, von denen aber das Leben der Zelle abhängig ist.

12. G. ORZECHOWSKI, Berlin.

Ueber den Einfluss von bekannten chemischen Substanzen auf isolierte Zellen und Gewebe

Die Kenntnis der Reaktion der Zelle auf humorale Reize ist heute ein Mittelpunkt des Interesses der Zellphysiologie. Die Beobachtung des Geschehens bei der Reizung eines Zellverbandes durch wirksame chemische Stoffe zeigt häufig, daß zuerst benachbarte Zellen zerstört werden. Die Elemente, deren Wucherung dem Beobachter eine Zellreizung anzeigt, entstammen dem mesenchymalen Bindegewebe. Die vegetativen Leistungen von Gewebezellen lassen sich experimentell in erster Näherung durch Wachstum und Zellvermehrung erfassen. Im Sinne der Cellularpathologie soll die Zelle als Elementarbaustein des Organismus die Fähigkeit haben, auf nutritive und formative Reize in grundsätzlich ähnlicher Weise zu reagieren wie ein Organismus selbst. Ob diese deduktive Forderung für humorale vegetative Reize zutrifft, ist unbekannt. Der Protist aber ist mit einer Gewebezelle nicht direkt vergleichbar. Bei der systematischen Prüfung der Frage der direkten Reizwirkung körperfremder chemischer Substanzen, von denen eine Wirkung am ganzen Tier bekannt ist, an Kulturen von Bindegewebe, ließ sich kein Anhaltspunkt dafür finden, daß die Zellen durch irgendwelche Konzentrationen solcher Stoffe zu gesteigerter Wachstumsintensität angeregt werden.

13. M. G. SEVAG, Berlin.

Respiration Mechanism of Pneumococci

In accordance with Wieland's theory the dehydrogenation of glucose and lactic acid in the presence of oxygen by means of *Pneumococcus* suspensions yields H_2O_2. O_2-consumed and H_2O_2 formed stand in direct ratio within first 10–20 minutes of reaction period. After which H_2O_2 per cent. falls as a result of its reaction with pyruvic acid formed simultaneously—$CH_3COCOOH + H_2O_2$ $CH_3COOH + CO_2 + H_2O$. Thus the evolution of CO_2 is based on a pure chemical reaction and is not of enzymic (carboxylase) nature. The removal of destructive inhibitory H_2O_2 by $CH_3COCOOH$ provides a defence mechanism for catalase—free living cells, efficiency of which compares well with that of catalase (for example: 788 per

cent. with $CH_3COCOOH$ and 1275 per cent. with catalase, within 200 minutes Vir. I (75)).

Analysis of glucose reaction mixture for $CH_3COCHOCH_3CHOH$-COOH, $CH_3COCOOH$ and CH_3CHO gave negative results; and $CH_3COCOOH$ and CH_3CHO in lactic acid reaction mixture could not be detected. In both cases, among other products of unknown nature, CH_3COOH and CO_2 were quantitatively determined. Metabolic functions of vir. and avir. Pneumococci are different. KCN does not inhibit, but accelerates the reaction up to 80 per cent.

WEDNESDAY, 23rd AUGUST

Morning Session 9.0 a.m.

Subject: Cell Form and Function as Demonstrated by Recent Advances in Tissue Culture.

Chairman : E. FAURÉ-FREMIET (Paris).

14. R. ERDMANN, Berlin.

Der Einfluss von Saüren, Toxinen und Hormonen auf des Wachstum und die Teilungs-rate von Epithel und Bindegewebe.

15. NIKOLAUS G. CHLOPIN, Leningrad.

Die Verwandlungsfahigkeit verschiedener Epithelgewebe im Explantat und ihre Bedeutung fur das Problem der Histologischen Determination

Eine vergleichende Untersuchung der Verwandlungsfähigkeit verschiedener Gewebe im Explantat zeigt, dass die bisjetzt untersuchten ekto- ento- und meso-dermalen Epithelien streng determinierte Gewebe vorstellen, welche zu einer Transformation in mesenchymale Derivate unfähig sind. Nach ihrer Verwandlungfähigkeit können die Epithelgewebe in mehrere Gruppen eingeteilt werden, welche ihrer histologischen Determination nach z. T. voneinander deutlich verschieden sind, z. T. engere genetische Beziehungen zu einander aufweisen. Die mehrschichtigen Epithelien der Hautgruppe und die einschichtigen Epithelien der Darmgruppe mit ihren Derivaten stellen zwei verschieden determinierte und zu einer gegenseitigen Verwandlung unfähige Gewebstypen vor. Die bisjetzt untersuchten mesodermalen Epithelien gehören verschiedenen Epitheltypen an, welche z. T. eine Ähnlichkeit mit den Epithelien vom Haut- oder vom Darm-typus aufweisen, z. T. sich von ihnen wesentlich unterscheiden. Die histologische Spezifität der Epithelgewebe muss als eine erblich festgelegte Eigenschaft aufgefasst werden, welche auf ihre phylogenetische Entwicklung zurückgeführt werden muss und bestimmte Vermutungen über die Art dieser Entwicklung auszusprechen erlaubt.

16. RAYMOND C. PARKER, New York.

The Races that Constitute the Group of Common Fibroblasts

The morphology of the common connective tissue cells, or fibroblasts, is well known. In appearance, they are all very much alike. From the standpoint of function, however, fibroblasts, as a group, comprise many cell types. Each race or type is characterised by the physiological properties that it manifests when cultivated as a pure strain under controlled environmental conditions. Thus, functionally distinct races of fibroblasts can be isolated not only from the various tissues and organs of a single chick embryo, but also from corresponding parts of embryos of different ages. The properties that distinguish these races reflect the relative physiological states, at the moment of isolation, of the particular parts from which they are derived ; they do not, as is commonly believed, serve as an index of age. The characteristics of the various races are permanent. They are retained by the cells indefinitely, despite such attempts as have thus far been made to change them.

17. JOYCE C. HILL and J. BRONTË GATENBY, Dublin.

On the Behaviour of Small Pieces of Mantle Cavity Wall of *Helix Aspersa* kept in Blood and Various Artificial Media

Small pieces of *Helix* continue to live for days when kept in hanging drops of blood. The mantle epithelial cells, amoebocytes, and pulmonary cavity epithelial cells wander out on to the coverslip. It is not necessary to take any aseptic precautions. All the preparations are contaminated by bacteria. The best results so far have been obtained by using Hédon Fleig Ringer. In this, the cultures reach their optimum at three or four days, the general appearance of the specimen being like that of the edge of the vertebrate explant. Large aggregations of amoebocytes can be procured in these cultures, but no division of mantle or pulmonary epithelial cells has been obtained. In many cases the explants grow out to form large vesicular structures which move when touched. The effects of intra vital staining have been studied.

18. H. PFEIFFER, Bremen.

Versuche über die Beeinflussung von Form und Adhäsion nackter Protoplasten

Unter Bezugnahme auf Ergebnisse der Explantationsmethode soll der Milieueinflusz auf Form und Adhäsion (stereotrope Funktion)

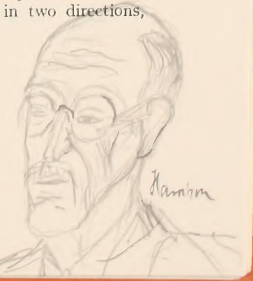
der Zelle *experimentell* erfaszt werden. An *pflanzlichen Protoplasten*, welche nach einem der Methode *af Klerckers* nachgebildeten Verfahren von der Wand entblöszt werden, lassen sich durch Anlegen von Konzentrationsgradienten pseudopodiale Formveränderungen hervorrufen, welche nach damit verbundenen Messungen einer quantitativ bestimmbaren Adhäsionszunahme symbath gehen. Analoge Konturwandlungen finden sich unter bestimmten Versuchsbedingungen an *Lymphocyten* u.a. Elementen des normalen und pathologischen *Liquors* (Belege durch farbige Reproduktionen von Dauerpräparaten der Liquorelemente und durch vergleichende Adhäsionsmessungen speziell an Lymphocyten in vitro), wie an *Blut-* und *Speichelzellen* usw. Erhöhter Formmetabolismus der Zelle, der wohl vorwiegend auf Oberflächenspannungserniedrigung beruht, ist also mit einer auf Adhäsionszunahme gerichteten Oberflächenveränderung eng verknüpft. So dürften auch die mit erhöhter Zellmotilität in Explantaten (wie bei Prozessen der Wundheilung) einhergehenden pseudopodialen Formwandlungen mit verstärkter Adhäsion koinzidieren und das *"stereotrope"* Verhalten kultivierter Zellen aus Gesetzen der physikalischen Chemie der Tropfen kausal verständlich sein.

19. K. J. FERINGA and J. DE HAAN, Groningen.

On the Influence of Changes of Medium on the Mode of Growth of Perfused Cultures of Migrating Cells

On adding different quantities of homologous or heterologous (ox) serum to the peritoneal perfusion fluid of a rabbit, the growth of perfused cultures of wandering cells of a rabbit is remarkably influenced in the following way: Addition of 10–50% serum (homologous or heterologous) is found to be rather strongly growth-promoting from the moment when the reticular tissue makes its appearance. Diluting serum with Ringer solution instead of with peritoneal fluid is not adapted for maintaining prolonged growth, and the cultures remain poorly developed. In pure serum a well-developed reticular tissue was seen only locally, and, as a rule, the cells showed a tendency to grow in a scattered way.

Various peculiarities of the cultures are discussed, viz. the appearance and significance of enormous giant cells, and in connection with this the differences between growth as a reticular tissue and as isolated wandering cells; the influence of the thickness of the layer of cells; the formation of fat cells; the tendency of the cells of a reticular tissue to grow (in succeeding layers) in two directions, crossing one another.



20. J. DE HAAN and K. J. FERINGA, Groningen.

On the Possibility of Forcing the Growth of Perfused Cultures in the Direction of an Adenoid (or Haemopoietic) System

Communication of experiments which tend to prove that the cultivation of wandering cells of an exsudation (rabbit), in a thick layer leads, as seemed probable from former researches, to the formation of large numbers of small lymphocytes, some of which die in a short time.

The culture, in producing these small cells, remains in a kind of labile state for a longer period; the whole very often resembles a lymphoid tissue. Multinuclear units, either isolated or forming part of a reticular tissue, split up into small lymphoid wandering cells. This process goes on for several days, but finally the normal mode of growth tends to prevail again. During a certain period (commonly the 3rd-5th day of cultivation), and under the influence of factors not yet wholly known, red blood corpuscles of typical form (biconcave discs, etc.) and normal dimensions, appear, apparently as a variation of the process of formation of lymphoid cells as it is not possible to trace in every case the classical stem cells of erythroblasts, etc. This formation of erythrocytes was seen in cultures, which in the beginning had been deprived of all erythrocytes.

21. J. ANDRÉ THOMAS, Paris.

La Culture de la Paroi de la Vésicule Ombilicale de l'embryon de Poulet; La Culture pure du Syncytium Vitellin Ombilical; Etude Histo-Physiologique.

Mode d'obtention et technique des cultures pures. Les propriétés protéolytiques et lipolytiques. Morphologie et cytologie des souches. Etude du noyau cellulaire. Les enclaves vitellines et leurs rapports avec la structure epitheliotypique. Evolution des cultures et transformation conjonctive des cellules endodermo-vitellines. Croissance et physiologie des cultures.

22. L. DOLJANSKY, Berlin.

Blutfarbstoff und die lebende Zelle.

Afternoon Session 2.0 p.m.

23. Z. ZAKRZEWSKI, Cracow.

Die Züchtung von Gewebe in Serum mit besonderer Betonung der Beziehung zwischen Zellwachstum und Zelldifferentiation

Eine Dauerzüchtung von Geweben war bis vor kurzem nur dann möglich, wenn den Kulturen passende Mengen von Embryonalextrakt zum Medium zugesetzt wurden. A. Fischer u. Parker fanden, dass Gewebe auch dann eine längere Zeit gezüchtet werden können, wenn sie mit Zusatz von Heparinplasma wachsen. Bei Zusatz von Blutserum gehen Kulturen bekanntlich schnell ein. Wird dagegen im Serum das Prothrombin auf irgend eine Weise zerstört, gebunden oder ausser Wirkung gesetzt, so wird dadurch das Serum in ein zur perpetuellen Züchtung gutes Medium umgewandelt. In solch einem Medium wachsen Gewebe langsamer als in einem prothrombinhaltigen und differenzieren sich allmählig. Blutserum enthält Nährstoffe und den Wachstumsaktivator Prothrombin in disponiebler Form. In reinem Serum gehen Gewebe daher ein, da sie zu stark zur Proliferation angeregt werden, analog wie in unverdünntem Embryonalextrakt. Durch alle Massnahmen, durch welche das Prothrombin ausser Wirkung gesetzt wird, kann eine Wachstumshemmung erzielt werden, wodurch eine spontane Differenzierung von Geweben eingeleitet wird. Physiologischerweise wird die Zellproliferation durch das Antiprothrombin gehemmt.

24. H. SCHADE, Kiel (Vortragender: R. Kiel).

Ueber eine physico-chemische Methode, die Gewebskultur im Eigenplasma ohne die bisher üblichen Zusätze durchzuführen

Es war unser Bestreben, sämtliche physico-chemischen Blut- und Gewebskonstanten in der Technik der Gewebezüchtung beizubehalten. Weitaus die grössten Schwierigkeiten machte dabei die Herstellung der richtigen Gasmischungsverhältnisse. Das lebende Gewebe ist ein System von Zellen mit der Eigenart, dass mit gasdichtem Abschluss der Einzelteile eine stets gleichartige reichliche Durchlüftung vereint ist. Dabei ist die Abweichung der Zusammensetzung der Blutgase vom Gasbestand der Luft sehr gross. Hier liegen die Hauptschwierigkeiten der Nachahmung für die Technik. Die wichtigsten Neuerungen sind die Gasmischapparaturen mit Grob- und Feineinstellung, sowie der Kammerraum

für die zu züchtende Gewebsart, in welchem Flüssigkeits- und Gasbewegung in geeigneter Weise vereinigt sind. Inwieweit die neue Technik die bisherigen Verfahren übertrifft, ergibt sich aus dem zellzüchterischen Erfolg. Bei Einhaltung sämtlicher physico-chemischer Gewebskonstanten kann man ohne Zusatz von wachstumsfördernden Fremdstoffen das Bindegewebe der Säugetiere (Rind) zur Dauerkultur bringen. Das Alter der Versuchstiere ist dabei von nebensächlicher Bedeutung.

25. D. SACHS, Paris.

Sur quelques propriétes de l'extrait des tissus embryonaires.

26. J. W. DUYFF, Amsterdam.

Growth Factors in Tissue Culture

Discussion of the usual methods of measuring growth and of the meaning of the word "growth" in tissue culture.

The influence of form and size of the explant, and of some environmental factors. Necessity of using series of identical cultures in studying the influence of various factors on the growth-rate. Methods of obtaining such cultures; the use of circular explants. The relation between surface and perimeter of the explant and its influence on the growth. The choice of a suitable medium; the use of a liquid medium in growth-experiments.

Methods of estimating the influence of cell migration by applying vital stain marks. The theory of growth; an attempt towards a general growth-formula.

27. M. NORDMANN, Tübingen.

Growth Factors in Tissue Cultures

28. GIUSEPPE GOMIRATO, Torino (Vortragender: G. Levi).

Die Wirkung der Kohlensäure und des Stickstoffes auf die "in vitro" Gezuchteten Zellen

Es wurde die Einwirkung der Kohlensäure in veränderlichen Prozentsatz (von 100% bis 12%) auf Herz-Kulturen (in Flaschen) des 7-tägigen Hünerembryos untersucht.

100% Kohlensäure zerstört binnen weniger Stunden das Explantat. Eine Mischung von 50% bis 12% Kohlensäure und Luft wirkt hemmend auf die Wanderung und die Teilung der Zellen; jedoch wenn die Kohlensäure entfernt wird, entwickelt sich die Kultur normal. Die hemmende Wirkung der Kohlensäure beruht nicht auf der Veränderung des pH, weil Kulturen mit Kaliphosphat gepuffert (pH = 5·9) noch entwicklungsfähig sind. Flaschen-Kulturen in denen die Sauerstoff vollständig durch Stickstoff ersetzt wurde, entwickeln sich, jedoch etwas langsamer als die Kontroll-Kulturen. Dadurch wird bestätigt dass die gezüchteten Gewebe in anaeroben Zustände überleben und sich vermehren.

29. FRITZ DEMUTH, Berlin.

Die Stellung der Experimentellen Zellforschung innerhalb der naturwissenschaftlich-medizinischen Forschung und Lehre.

Die Methoden und die Ergebnisse der experimentellen Zellforschung werden infolge von Unkenntnis der fernerstehenden Forscher und Lehrer falsch eingeschätzt und sind z.T. infolge schlechter Publikationen in Mißkredit geraten.

Die experimentelle Zellforschung muß als ein besonderes Fach innerhalb der naturwissenschaftlichen und medizinischen Forschung und Lehre angeschen werden, weil sie

(1) von keiner Schuldisziplin voll umfasst wird,

(2) ihrerseits auf die verschiedensten Disziplinen übergreift,

(3) die volle Beherrschung einer besonderen, zeitraubenden und schwierigen Technik voraussetzt.

Sie ist nicht nur eine Methode, am wenigsten eine Methode der Histologie oder der pathologischen Histologie.

Es ist ungünstig, daß durch Einrichtung von kleinen Laboratorien an den verschiedenen Instituten der Schulfächer eine Zersplitterung hervorgerufen wird. Bei dem Stande der Methodik ist es unbedingt erforderlich, daß Arbeiten auf dem Gebiete der experimentellen Zellforschung an Spezialinstituten ausgeführt werden, an denen man die Technik einwandsfrei beherrscht und an die Forscher aus anderen Disziplinen zu Sonderarbeiten entsandt werden.

Die Mittel für diese Spezialinstitute müssen reichlich sein.

Die Forschungsergebnisse der experimentellen Zellforschung sollen von besonderen Fachleuten an den Universitäten vorgetragen werden, da nur sie die zahlreichen Publikationen richtig abzuschätzen imstande sind. Die in die Literatur übergegangenen Unrichtigkeiten sind auszumerzen.

Die internationale Gesellschaft für experimentelle Zellforschung und ihre Mitglieder sollen in kritischen Referaten regelmäßig Übersichten über die Literatur geben, in denen vor allem die technisch unzureichenden Arbeiten ausgeschaltet werden.

Sie sollen in diesem Sinne auf die Regierungen ihrer Länder und die Lehrkörper ihrer Universitäten einwirken.

THURSDAY, 24th AUGUST

Morning Session 9.0 a.m.

Subject: Electrophysiology of the Cell.

Chairman : E. D. ADRIAN (Cambridge).

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30. E. D. ADRIAN, Cambridge.

Electric Discharges from Nerve and Muscle (with demonstration)

An excited sense organ discharges a rapid series of impulses up the sensory nerve fibre, the frequency varying with the degree of excitation. An excited motor nerve cell behaves in the same way, discharging a series of impulses to the muscle. Thus the sensory endings and the cell body or dendrites respond by rhythmic depolarisation to certain changes in their environment. Their reaction is greatly influenced by various ions (Na′, K′, Ca″, etc.). The nerve fibres are much less sensitive to their surroundings, though they may be made to respond rhythmically by injury, etc. The same kind of mechanism is latent in striated muscle fibre, for immersion in NaCl solution gives a rhythmic discharge comparable to that from a sense organ or nerve cell.

31. R. BEUTNER, Louisville.

The Vital Battery System

Experiments were undertaken to determine how the various differentiated components of the cell can give rise to electromotive forces owing to the chemical differentiation which they undoubtedly possess. Chemically different structures can give rise to electric currents by simple contact just as is done by different metals, e.g. zinc and copper in contact with an electrolyte.

(1) Testing an immense number of materials it was found that an *acidophilic* substance when suitably combined with a *basophilic*

substance invariably gives rise to considerable forces. A suitable combination is e.g.:

+ salt soln.	basophilic substance	acidophilic substance	salt soln. —

the electromotive force is usually about 1/10 volt.

Manifestly such sources of currents must be present somewhere in tissue, possibly about the nucleus and the cytoplasm (although of course, the nucleus is by no means always basophilic).

Other possible combinations which may generate currents *in vivo* are of the following types :

(2)

+ salt soln.	high molecular substance	decomposed or split substance	salt soln. —

This system illustrates the influence of metabolism on bioelectric currents.

(3)

+ salt soln.	permeable substance	less permeable substance	salt soln. —

illustrating how currents can be generated by contact of two membranes, one of which is more permeable than the other. (Moreover, currents can be generated if a single membrane is in contact with two different salt solutions.)

(4) Finally :

+ salt soln.	oxidised substance	reduced substance	salt soln. —

illustrating the influence of respiration upon biological currents (compare Lund).

Practical examples of all these different modes of generating currents will be described in detail.

32. S. C. BROOKS, California.

The Relation between Ions and Potential Differences across Plasma Membranes

33. TH. HUZELLA, Budapest.

Electrical Phenomena in Tissue Cultures in Relation to Organisation

Experiments were made in order to produce changes in the typical organisation of tissue cultures by electrical stimulation with non-polarisable micro-electrodes and in the electric field.

The effect of appropriate electric current on the changes in the form of the cells, the directive influence of the electric field on cell movement, on the rate of migration of different cells, on the orientation of tissue growth and on the spontaneous activity of tissues, such as cultures of the heart and the intestine were examined. The electrical reactions of the system of argyrophil fibrils as a whole were studied with special attention, in comparison with intracellular strands of infusoria. Interrelations were found between structural changes and electrical reactions, which could be ascribed to dissociated particular factors due to direct electrical actions or to the indirect chemical effects induced by them, in interaction with electrochemical surface-reactions between cells and intermediary boundary-layers, altering the conductivity, permeability and viscosity of the tissue elements.

34. K. UMRATH, Graz.

Der Erregungsvorgang

Der vom Muskel und Nerven her bekannte Erregungsvorgang ist allgemein nur durch die ihn begleitenden elektrischen Veränderungen, Verschwinden oder Zurückgehen des Zellgrenzpotentials, manchmal nachherige vorübergehende Steigerung über die Norm, zu erkennen. In besonderen Fällen ist er mit weiteren Reaktionen verbunden, wie Bewegungsvorgängen, Protoplasmaströmungsstillstand u.a., welche dann, wie der Aktionsstrom, dem Alles-oder Nichtsgesetz unterliegen. Bisher wissen wir über Vorkommen und Art des Erregungsvorgangs bei den meisten Zellen noch gar nichts, doch haben schon die wenigen genauer untersuchten Fälle, sensitive Pflanzen, Nitella, Ergebnisse von allgemeinem Intresse gezeitigt. Ich erwähne daß sich während des Erregungsvorgangs Viskositäts-Permeabilitäts- und rH-Änderungen nicht nachweisen lassen. Die elektrische Erregbarkeit scheint der Kondensatortheorie nicht zu entsprechen, sondern eher einer Theorie, die mit physikalisch-chemischen Vorgängen in der Zellgrenzfläche rechnet. Auch für die Erregungsleitung scheint eine ähnliche Theorie Vorteile gegenüber einer an das Kernleitermodell angepaßten zu haben.

35. HUGO FRICKE, Cold Spring Harbor, N.Y.

The Electric Resistance and Capacitance of Suspensions of Red Corpuscles with an application to the Study of Hemolysis

The passage of an electric current through a red corpuscle suspension is greatly influenced by the surface of the corpuscle

which acts as a resistance in series with a capacitance. The values of these two quantities have been measured over a frequency range of from 250 to 16×10^6 cycles/seconds. When referred to unit of corpuscle surface, the values are found to be the same for rabbit, chicken and turtle. While the possibility that the action of the surface is due to a polarisation can not be definitely excluded, yet a more congruous explanation is that the corpuscle is surrounded by a poorly conducting membrane, about 40 A.U. thick, which acts as an electric condenser. The frequency dependence of the dielectric constant of the membrane and the value of the power factor, which are derived from the measurements, serve as a means of characterising the membrane. The method has been used in a study of hemolysis. It is found that while hemolytic agencies may change or destroy the membrane, the process of hemolysis itself does not necessitate any change of the electric properties of the membrane.

36. W. A. H. RUSHTON, London.

The Significance of "Chronaxie"

The paper is an introduction to a discussion upon the validity and usefulness of Lapicque's views, especially with reference to recent criticism. According to Lapicque the chronaxie of an excitable element is of importance for two reasons.

(*a*) The measure is specific for the element, it measures not only the rate of the excitatory process, but also the rate of propagation, of contraction (if any), of electric response, of summation interval, etc.

(*b*) The theory of isochronism lays down that a propagation of impulse from one cell to another can only occur if the two have approximately the same chronaxie (within 2·1 ratio).

Recent work throws doubt on both these statements. The chronaxie is usually enormously dependent upon the type of electrode employed; isochronism is not a *sine qua non* of conduction from one cell to another; curarisation is not brought about by alteration of chronaxie.

The technique and value of chronaxie measurements are discussed in the light of the foregoing.

37. JULIA LENGYEL, Budapest.

Biological Effect of the Magnetic Field on Tissue Growth

In contradiction to the general view that magnetism produces no biological effect at all, fundamental changes could be observed

in the growth of tissue, cultivated in the magnetic field. They consist especially in an increased proliferation and reduced organisation, in a reversion of the organotypic to the cytotypic growth and in abnormity in the form of the cells. All these changes could be reduced to the primary alteration in the development and formation of the intercellular fibrillar system due to the perturbance, by the magnetic forces, of the electrochemical reactions, which are most probably engaged in the aggregation of the micellar substance. By means of further investigation it is possible to distinguish the dissociated phases of the magnetic effect on the whole of the cultures in the interaction of the cells and the intercellular substance.

Afternoon Session 2.0 p.m.

38. W. L. FRANCIS, Cambridge.

Electrical Properties of Isolated Frog Skin

Experimental methods are described for the investigation of the means by which the electrical potential across an isolated piece of frog skin is maintained. The potential is not due to glandular activity and is not an injury potential. Glucose ringer solution *p*H 8·3 at 15° C. is the optimum medium for the maintenance of the potential. Complete oxygen starvation destroys the potential rapidly and irreversibly. The dependence of the potential and the oxygen consumption of the skin on the oxygen concentration in the medium is the same. The potential is an accompaniment of respiration processes in the skin. By means of reversible electrodes a continuous current may be drawn from the skin and the output of electrical energy measured. This is about 10 per cent. of the energy available from respiration. The variation of respiration rate and electrical energy output with temperature have been measured and compared. The theoretical interpretation of the frog skin potential is considered.

39. R. J. PUMPHREY, Cambridge.

The Electrical Properties of the Frog's Skin

The resting potential is a maximum when the external surface of the skin is in contact with pure NaCl solution isotonic with Ringer; partial substitution of K or Ca for Na causes a marked fall.

When the potential is measured during the passage of currents

of small density across the skin, and is plotted against the current density, the form of the curve depends on (*a*) the direction of the current, (*b*) the concentration and (*c*) the species of cation in contact with the external surface. With potassium the curve is linear at all concentrations. With sodium and calcium, when the positive current passes from the outside to the inside of the skin, the ratio E.C. increases up to a limit with increase in current density. The form of the curve is comparable with that obtained with inert electrodes in salt solutions. The frog's skin therefore behaves like an electrode reversible for potassium, but not for sodium or calcium ions.

40. E. J. LUND, Austin.

The Linkage between Continuous Production of Electric Energy and Cell Oxidation

If the continuous output of electric energy by an electrically polar cell or tissue is linked with the flux equilibrium of cell oxidation and the velocity of the latter is a function of oxygen tension, then the P. D. and output of electric energy should be quantitatively related to the oxygen tension. This is the fact. It will be shown that the electric polarity of a polar tissue can be increased, decreased or inverted at will by means of change in O_2 tension. This direct control appears to involve only the polarity of the cells to which the change in tension of oxygen is applied, and therefore yields additional evidence for the principle of Summation of Cell Polarities.

The significance of the facts for the author's conception of the mechanism of cell correlation and other cell processes will be presented.

41. S. GELFAN, Cambridge.

The Degree of Independence between the Contractile and Conductile Mechanisms in the Muscle Fibre

A skeletal muscle fibre may contract without any action potential. This is not only true for contractures, but also for twitches. The submaximal responses of single muscle fibres as produced by microstimulation are not accompanied by the electrical response, but do exhibit the characteristic diphasic action potential when with further rise in the strength of the stimulating current the maximal propagated response is evoked. The submaximal responses

of the single fibre, whether produced by induction shocks or constant currents of long duration, are in no way different in their mechanical response from maximal twitches. These responses seem to be elicited by a direct stimulation of the contractile process without at the same time initiating the conducted response, indicating that contraction may occur independently of the conduction or action potential mechanism at a time when the latter is normal and capable of functioning.

42. E. K. RIDEAL, Cambridge.

Phase Boundary Potentials

For the examination of reactions taking place at interfaces which are important in biological systems, the method of determination of the phase boundary potential possesses certain advantages. Not only can one examine the reaction kinetics of extremely small quantities of material, but the influence of molecular orientation at interfaces on the reaction kinetics can be systematically investigated. A number of systems which find their counterpart in biology have already been examined by this method. It has been found, for example, that the rate of oxidation of unsaturated fatty acids can be altered from high values to almost negligible proportions by mere alteration of the orientation of the molecules of the acid film. A similar alteration in the reaction velocity can be observed in the hydration of a lactone ring. Monolayers of protein such as albumen and casein and their reactions both to chemical and enzyme systems can be readily examined by this method. In the latter case it has been found that an enzyme separated from its substrate will react only with proteins when presented to it in the form of a monolayer.

FRIDAY, 25th AUGUST

Morning Session 9.0 a.m.

Subject: Entwicklungsmechanik and Explantation

Chairman: W. VOGT (Zurich).

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43. J. HOLTFRETER, Berlin.

Determination in der fruhen Entwicklung.

44. C. H. WADDINGTON, Cambridge.

Developmental mechanics of warm-blooded embryos

There are two main methods of experimental analysis of embryonic development: firstly, isolation of fragments of the embryo in "neutral" media which permit the unfolding of any inherent differentiation-capacities of the isolate; and, secondly, transplantation of fragments to different situations within the embryonic body. The first of these methods was, for technical reasons, applied to warm-blooded embryos earlier than the second. The paper will discuss the limitations of the method of isolation and will summarise the results which have been obtained by the application of the transplantation method to warm-blooded embryos (avian and mammalian) cultivated *in vitro*.

45. J. NEEDHAM, C. H. WADDINGTON, and D. M. NEEDHAM, Cambridge.

Physico-chemical Experiments on the Amphibian Organiser

In recent work on the process of induction by organisers in early embryonic development, it has been shown that the organising tissue retains its activity after being narcotised, crushed, dried, frozen, or boiled. This strongly suggests that at least certain parts of

organiser action are due to a definite chemical substance contained in the active cells. Further support for such a view is now provided by experiments in which cell-free aqueous extracts, and also ether and petrol-ether extracts, both of urodele neurulae and of later stages, are shown to possess organiser activity.

46. H. B. FELL, Cambridge, and R. G. CANTI, London.

Joint-formation *in vivo* and *in vitro*.

The normal development of the knee-joint of the Fowl from the 4th to the 10th day of incubation is described.

The prechondral rudiment of the limb-skeleton when removed from the leg-bud of a 4-day embryo and cultivated *in vitro*, continues its anatomical and histological development. An account is given of the differentiation of the knee-joint in the living culture, as recorded and analysed by micro-cinematography.

The factors responsible for joint-formation are discussed.

47. E. TÖRÖ, Debreczen.

The Implantation of Organ-rudiments which have been Cultivated for Different Periods of Time

Die Einpflanzung verschieden lange gezüchteter Organstücke in das Auge. Nach Explantation verschiedener embryonalen Organstückchen wurde das Epithel und das Bindegewebe isoliert.— Die Reinkulturen wurden an Stelle der Augenlinse des Hünchens implantiert.—Bei der histologischen Verarbeitung der Implantate wurde festgestellt, dass die Gewebe *in vitro* ihre embryonale Pluripotenz parallel mit der Dedifferenzierung wiedererwerben und nach der Implantation in die Augenkammer unter Einfluss der Umgebungsfaktoren und des organspezifischen Epithels sich reorganisieren können.—Bei einer Gruppe bildet sich die ursprüngliche Struktur der Ausgangsorgane aus / Darm / bei den anderen gestaltet sich eine neue Struktur aus / Herz, Urniere, Niere / oder geht das Epithel zugrunde und nur das Bindegewebe bleibt am Leben.— / Lunge, Leber / Das Implantat reagiert einerseits auf die Wirkung der Umgebungsfaktoren, die bei dem Aufbau der äusseren Form die leitende Rolle spielen.—Andererseits bildet das Bindegewebe unter der Induktion des spezifischen Epithels eine spezifische Struktur aus und die Struktur der eigenartigen Organisation der Implantate wird noch durch die Umgebungsfaktoren noch vervielfältigt.

48. J. TANNENBERG, Frankfurt-a-M.

Die Implantationsmethode einer durchsichtigen Kammer in das Kaninchenohr (Clark-Sandison) und ihre Ergebnisse

Schilderung des Verfahrens der amerikanischen Autoren in seinen verschiedenen Modificationen. Das Verfahren gestattet es, die Entwicklung der cellulären Wachstumsvorgänge sowie die Entwicklung eines Granulationsgewebes mit Gefässen aller Arten über Wochen und Monate am lebenden Kaninchen mikroskopisch zu verfolgen, ohne dass nach der Implantation der Kammer weitere Operationen notwendig wären. Abgesehen von der Entwicklung des autochthon entstehenden Granulationsgewebes, kann das Verhalten verschiedener Gewebsarten in der Kammer studiert werden, die in die Kammer explantiert werden. Es wird ein Film gezeigt, bei dem Vorgänge in einer von dem Verf. modificierten Kaninchenohrkammer aufgenommen sind. Der Film zeigt verschiedene Stadien der Entwicklung eines Granulationsgewebes am lebenden Tier, Strömungsphänomene an den Kapillaren, das Verhalten der roten Blutkörperchen, insbesondere bei der Entwicklung der Stase, die Blutplättchen in ihrer Strömung im lebenden Gefäss, die Leukocytenanreicherung und vollständige Auswanderung bei Entzündungsvorgängen an den Gefässen der Kammer.

49. CARL CASKEY SPEIDEL, Virginia.

Growth, Irritation and Repair of Nerves

Individual nerve fibres have been directly observed in living frog tadpoles for prolonged periods, both under normal and experimental conditions. The behaviour of the ameboid growth cones, as influenced by directive lines, barriers, the electric current, and nearby cell mitoses has been recorded; also the formation of varicosities, anastomoses, giant cones, and the process of nerve autotomy.

The entire process of myelin sheath formation has also been watched, more than 100 complete case histories of myelin segment origin having been obtained.

Following nerve section the exact phenomena of regeneration depend partly upon the composition of the cut nerve. Several varieties of readjustment and regeneration may occur.

Details of the effects on single fibres have also been noted of burns and scalds, freezing, pressure, strong anaesthetics, starvation, alcohol intoxication, acids and alkalies, X-rays, endocrine gland extracts, and other agents.

Ciné-photomicrographs have been made which show the growth of nerve sprouts, activities of sheath cells, myelin sheath origin, and phenomena of irritation, degeneration and repair.

50. T. TERNI, Padova.

Microdissection et U.V. microradiopiqûre des spermatozoides

Des experiences avec la methode de Chambers-Péterfi et avec la technique de Tschachotin avec U.V. de $\lambda = \mu 0{,}275$ sur des spermatozoides des Urodeles (surtout de *Geotriton fuscus*) ont demontré:

(1) Que le centrosome (cou du spermatozoïde) ne represente pas, comme l'on croyait, le centre du mouvement de la queue. En effect, en sectionnant la queue en deux ou plusieures morceaux, le mouvement peut continuer dans les tronçons isolés.

(2) L'ourlet de la membrane ondulée possède une structure fibrillaire et represente l'unique siége du mouvement.

(3) L'ourlet est contractile comme un flagelle, avec une capacité de contraction même partielle et discontinue. En piquant avec l'aguille ou en rayonnant avec l'U.V. le flagelle, le mouvement s'arrêt dans le seul point de la lesion, mais il continue au deci et au delà, parfois inverti.

(4) Ce flagelle possede une forme ondulée, élastiquement aussi bien que cinétiquement determinéc: forme qui permets cependant la conduction longitudinal du mouvement.

(5) La condition nécessaire au maintien de la vibration de l'ourlet, est son insertion normale au filament axil.

(6) En rayonnant la tête du spermatozoide, l'on observe des deformations, qui ont à faire avec des modifications de la perméabilité cellulaire.

51. M. PARAT, Paris.

L'acrôsome du spermatozoide et le deuxième facteur de la parthénogénèse experimentale chez les Batraciens.

Afternoon Session 2.0 p.m.

Subject: Cell Secretion and Digestion.

52. ROBERT CHAMBERS, New York.

Some Features of Cell Permeability in Relation to Kidney Function

In tissue culture, cut-up segments of mesonephric tubules, within the explant, are converted into closed tubules. Phenol red, in solution, accumulates within the lumina of segments of proximal tubules which become greatly distended thereby. This unidirectional passage is not affected by variations, within viable limits, of the *p*H of the medium and of the lumina of the tubules. On the other hand, it is reversibly upset by sublethal doses of KCN, by exposure to cold, to CO and to N_2 gas in concentrations which reversibly stop the beat of heart cells in tissue culture. Ethyl urethane in similar doses has no effect. The vital stain, neutral red, accumulates within the cells under all viable conditions and passes into the lumen only under special *p*H conditions.

The passage of phenol red appears to be due to an intracellular mechanism (possibly oxidative) while that of neutral red depends upon extracellular *p*H conditions.

53. HARALD OKKELS, Copenhagen.

Cellular Structure and Cellular Function. Contributions to the Dynamic Cytology of the Thyroid Gland

For research on dynamic cytology the ideal gland to study is the thyroid. Distinct morphological changes accompany its function; its degree of activity can be measured by the rate of metabolism, and stimulation or inhibition can easily be established.

Anterior pituitary extract activates the thyroid by inducing absorption of the colloid. This causes an increase of the Golgi apparatus without influencing the mitochondria. Neutral red droplets in the thyroid cells after vital staining are increased too. These droplets and the Golgi apparatus are considered separate structures.

The enlargement of the Golgi apparatus goes parallel with the rise in standard metabolism. Hence the Golgi apparatus may be considered an indicator of specific activity in the thyroid gland.

When colloid is being restored the mitochondria are increased. They seem to play the rôle of condensators. Iodine stimulates this particular feature of thyroid secretion, but does not influence the Golgi apparatus.

The unique position of the thyroid gland from a histo-physiological viewpoint is due chiefly to its faculty of storing a provisional secretion outside the cells, and consequently in larger quantities, and for a longer time than any other gland.

54. P. RONDONI, Milan.

Some Observations on Proteolytic Enzymes in Cells

Cathepsins (cellular proteases) of normal liver (rabbit) and of mouse cancer tissue were investigated by R. and a co-worker (L. Pozzi). The enzymes were tested on the proteins of the same organ (digestion of glycerol-water extracts, gravimetric determination of undigested protein) as described in a previous work (R., *Biochem. Journ.*, **26**, 1477, 1932). The accelerating action of cysteine was confirmed; this action is enhanced by an iron salt (Fe^{++}). Glycogen shows an inhibiting action. Oxidising agents (H_2O_2, current of O_2) more or less prevent digestion, they often produce in digested extracts an increase of substances precipitated by trichloroacetic acid: a protein synthesis is supposed.

Dependency of protein synthesis upon oxidation may be important for the understanding of tumour growth.

In tumour extracts no special activator of proteolysis could be detected.

55. E. S. DUTHIE, Dublin.

Mechanism of Glandular Secretion

The formation of secretion granules in relation to the mitochondria, and their subsequent movement into the Golgi zone has been followed in the living animal. By a comparison of vitally stained and fixed preparations a similar process has been traced in other gland cells, including mucous and serous cells of the salivary glands. The behaviour of these granules to vital dyes (neutral red and Janus green) has been noted, as also the formation of large intracellular vacuoles in the case of the former dye. Parat's vacuome theory is discussed in view of the results obtained.

56. **M. VOLKONSKY, Paris.** (lu par A. Lwoff).

L'aspect cytologique de la digestion intracellulaire

La réaction du cytoplasme à l'ingestion d'une particule étrangère offre une grande similitude dans les différentes catégories de cellules phagocytaires: la particule étrangère, entourée d'une pellicule aqueuse (*progastriole*), fusionne avec les éléments du vacuome (*réaction vacuolaire*) pour donner naissance à une *gastriole*, où la digestion prend place. Des éléments du chondriome peuvent s'accoler à la surface de la gastriole (*réaction chondriosomique*). L'intervention du vacuome est interprétée comme réalisant un apport de ferments digestifs; le chondriome intervient, semble-t-il, dans les processus anaboliques. Les deux étapes successives de la digestion intracellulaire peuvent être comparées à celles (de secrétion, puis d'absorption) de la digestion extracellulaire. Un processus semblable à la *réaction vacuolaire* peut être observé dans d'autres phénomènes que la digestion phagocytaire (p. ex.: dans la digestion des enclaves vitéllines). Dans certains cas, la présence de substances vacuolaires dans une *gastriole* peut se manifester dans ce sens que la *gastriole* assume les fonctions physiologiques d'un élément du vacuome.

57. **E. B. BOLDYREFF, Battle Creek.**

Contribution to the histo-physiology of the Pancreas: The effect of Insulin on acinus cells and distribuion of the islands.

Wednesday p. m.

58. **L. BUCCIANTE e A. FOA, Torino.** (Vortragender: G. Levi).

Wirkung der α Strahlen von Radiumemanationen über in vitro gezuchtete Nervenfasern

Es wurden durch α Strahlen, deren biologische Wirkung beinahe unbekannt ist, einzelne aus embryonalen Gehirnexplantaten hervorgewachsene Nervenfasern bestrahlt; Radiumemanationen waren in sehr feinen an beiden Enden geschlossen Glas-Kapillaren enthalten; die α Strahlen konnten durch die 2–3μ starke Wand der Pipette dringen. Dieses wurde durch die Beobachtung im Mikroskope im Dunkelzimmer auf einem Schirme von Zinksolfur direkt bewiesen (Funkeln der α Strahlen). Nach 2–3 Minuten wurde eine beschränkte Stelle der Nervenfaser zerstört; nachter entstehen an der Oberfläche der Faser Blasen und die amöboide Tätigkeit hört vollständig auf. Diese Veränderungen sind zweifelsohne durch die α Atome (Elios) bewirkt; wenn eine Glasplatte zwischen der Nadelspitze und der Kultur dazwischen geschoben wurde, bleibt die Nervenfaser unverändert.

59. **A. POLICARD, Lyon.**

"Quelques perfectionnements et résultats nouveaux en histospectrographie. Perfectionnements apportés au dispositif primitif d'histospectrographie de Policard-Morel"

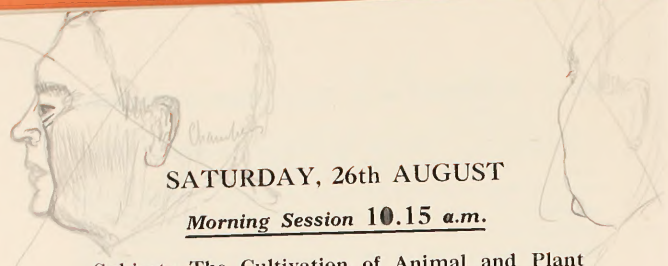
1°, platine, mobile dans tous les sens, déplacant la coupe sous l'électrode supérieure fixe, ajustée dans l'axe optique du spectrographe.

2°, microscope et lampe annexe permettant l'examen du point choisi, même pendant l'étincelage.

3°, choix d'électrodes variables suivant l'élément cherché.

4°, générateur d'étincelle de haute fréquence permettant de faire varier leur énergie.

Exposé des résultats nouveaux obtenus (Cu et Au dans les tissus).



SATURDAY, 26th AUGUST

Morning Session 10.15 *a.m.*

Subject : The Cultivation of Animal and Plant Viruses.

Chairman : H. LÖWENTHAL (Berlin).

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60. EUGEN HAAGEN, New York.

Yellow Fever Virus in Tissue Culture

The behaviour of two strains of mouse-adapted yellow fever virus in tissue culture has been observed. The virus has been cultured through more than one hundred generations without change in pathogenicity in a medium consisting of normal monkey serum, diluted ten times with Tyrode solution, and living chick embryo cells. Culture virus contained in this medium may be kept virulent for more than half a year if dried while in the frozen state. Like all other viruses cultured *in vitro* the yellow fever virus requires living cells for growth.

Virus having entered into a living cell in the culture medium is not acted on by immune serum. However, virus contained in dead cells is destroyed under these conditions.

Histological examination of rabbit tissues infected *in vitro* with yellow fever virus demonstrates intranuclear changes in the affected cells. These changes are most distinct in corneal and testicular tissues. The nuclear chromatin shows acidophilic granulation similar to the changes in the tissues of infected animals.

61. G. HARDY EAGLES, London.

The "In Vitro" Cultivation of Filterable Viruses

The cultivation of certain filterable viruses affecting animals may now be considered as definitely established. The main controversial point is whether living cells is an absolute essential to cultivation. When the living, particulate nature of certain viruses

such as fowl-pox, vaccinia and ectromelia is considered it appears reasonable that their cultivation should have something in common with the bacteria. The types of tissue change found in virus infections are not essentially different from those due to bacterial infections and cell inclusions need not necessarily be an indication of the essential parasitic nature of the virus bodies. It is probable that the penetration of epithelial cells which takes place is a result of massive proliferation of the virus bodies, the invasion being secondary. In vaccinia the results with cultivation in a cell-free medium points to such a conclusion. While cells are advantageous to cultivation they do not seem to be essential. The main difficulty lies in establishing the virus in primary culture and the succeeding early sub-cultures. Many attempts must be made and sub-culture continued in spite of falling titre. On account of the great variation among individual flasks in a culture they must be titrated separately since pooling leads to excessive dilution of existing virus. It is suggested by a late series of culture experiments that the enormous amount of chromatin granules present in the cell-free medium may play an important part.

The occurrence of elementary bodies in great numbers in sub-cultures throughout a series in cell-free medium is important evidence of the ability of vaccinia virus to grow in the absence of cells.

62. HENRY PINKERTON, Boston.

The Study of Typhus and Rocky Mountain Spotted Fever by the Tissue Culture Method

The micro-organisms causing these two diseases are obligatory intracellular parasites of bacterium-like morphology. Under natural and artificial conditions, they multiply only in the cytoplasm of their host cells. In tissue cultures of infected cells, incubated at 32° C., typhus Rickettsiae multiply voluminously, distending the cytoplasm of practically every cell, but never invading nuclei. Infection spreads slowly from cell to cell. Infected cells undergo mitotic division and infection is transmitted to daughter cells. The equilibrium (practically symbiosis) continues indefinitely at 32° C., but Rickettsiae disappear in three days if cultures are incubated at 37° C. Spotted fever Rickettsiae under similar conditions multiply sparsely in the cytoplasm of their host cells,

but form rounded eosinophilic clusters in the nuclei. Infected nuclei undergo swelling and wrinkling of the nuclear membrane. Individual organisms are frequently difficult to resolve. These intranuclear structures are compared and contrasted with "inclusion bodies."

63. E. STRIEGLER, Insel Riems.

Die Züchtung des Maul-und Klauenseuchevirus

Die Vermehrung des Maul-und Klauenseuchevirus in vitro hat grosse praktische Bedeutung erlangt. Es gelingt durch Einspritzung von Kulturvirus den Serumtiter durchgeseuchter Rinder beträchtlich zu steigern. Die Forschungsrichtung musste sich den praktischen Forderungen anpassen. Zur Gewinnung grosser Massen musste die einfachste Züchtungsmethode ausgearbeitet werden, die ein möglichst infektiöses und virulentes Kulturgut als Impfstoff liefert.

Die Züchtungstechnik ist einfach und sicher gestaltet worden dadurch, dass es gelungen ist, das Virus der Maul-und Klauenseuche im flüssigen Medium zur Vermehrung zu bringen.

Um optimale Züchtungsbedingungen herzustellen, ist es erforderlich, den Kulturen Meerschweinchenserum oder Meerschweinchenplasma zuzusetzen. Im Verlaufe der Züchtung wird das Virus anspruchsloser. Es gelingt dann auch eine Züchtung ohne Serum- oder Plasmazusatz.

Es wurde eine Gesetzmässigkeit der Virusvermehrung in den Kulturen gefunden. Das Optimum ist nach 24 bis 37 Stunden erreicht.

Im Verlaufe der Züchtung verschiebt sich die Reaktion vom schwach-alkalischen Gebiet über den Neutralpunkt nach dem alkalischen zurück. Bei neutraler Reaktion haben die Kulturen ihre Höchstinfektiosität erreicht.

64. S. SUZUKI, Tokyo.

Tsutsugamushi-Studien

65. C. H. ANDREWES, London.

The Application of Tissue-culture Methods to some Problems in Virus Pathology

The cultivation of viruses in tissue cultures is not merely an interesting achievement, but a method capable of useful application to a number of problems. I have employed it in studying immunity

to viruses, particularly those of herpes simplex and Virus III of rabbits. These two viruses will form intranuclear inclusions *in vitro* in cultures of rabbit testis. Antiserum added to the cultures before or simultaneously with the virus prevents the formation of these inclusions, apparently preventing infection of the cells. If virus is first incubated a short time with the cultures, inclusions will form despite the subsequent addition of undiluted serum. It can be shown in this way that Virus III can infect cells very rapidly at 37°, but much less readily in the cold.

Afternoon Session 2.30 p.m.

66. T. MASUDA, Kioto.

Studien über die Antikörperbildung unter Anwendung der Gewebezüchtung

In dem Mikrobiologischen Institut der Kaiserlichen Universität zu Kyoto ist unter Leitung von Prof. Dr. Ren Kimura die Antikörperbildung unter Anwendung der Gewebezüchtung mehrfach erforscht. Die Resultate in bezug auf Bakterien-, Hämagglutinin, Präzipitin, Hämolysin, bakteriziden Stoff, komplementbindenden Antikörper und viruliziden Stoff werden erörtert.

67. A. KRONTOWSKI, Kiew.

Züchtung des Vakzinevirus in Gewebskulturen und in Medien ohne lebende Zellen.

(1) Die Züchtung des Vakzinevirus gelingt sowohl in echten Gewebskulturen als auch in Tyrode-Lösung mit zerkleinerten Embryonalgeweben.

(2) Systematische Auswertungen an Kaninchen nach *Groth* zeigen ganz bestimmt, dass in den in vitro-Kulturen nach beiden Methoden eine starke Vermehrung des Virus der Dermovakzine, Neurovakzine und humanisierter Kinderlymphe stattfindet.

(3) Virus-Kulturen von hohem Titer lassen sich durch Züchtung sowohl mit Hühnerembry onalgeweben als auch mit Geweben von Menschenembryonen erhalten.

(4) Im Medium von *Eagles* (hergestellt genau nach der Technik von *Eagles* und *Kordi*) ohne lebende Zellen konnten wir bei systematischer Auswertung der Kulturen vor und nach der Inkubation

keine wirkliche Vermehrung des Virus feststellen, obwohl in diesem Medium ein Überleben des Virus stattfindet, so dass manchmal die Anfertigung von "Subkulturen" möglich ist.

(5) Aus einzelnen Tropfenkulturen im Plasma, die sich für die Aufbewahrung des Virus eignen, lassen sich nach Wunsch Massenkulturen anfertigen ; im Laufe von 5-10 Tagen erhält man Vakzine von hohem Titer, in Mengen, die für die Schutzpockenimpfung der Bevölkerung ausreichen.

68. J. HENDERSON SMITH, Rothamsted.

The Size of Plant Viruses

By the use of graded collodion membranes it is found that the virus of tobacco mosaic and the virus of yellow tobacco mosaic can pass through pores ·051μ in diameter, the aucuba virus of tomato passes ·112μ but not ·10μ; the virus of a mosaic of Hyoscyamus passes ·30μ but not ·234μ. From these data it is calculable that these viruses range in size from about 15$\mu\mu$ for the tobacco viruses to 150$\mu\mu$ for the Hyoscyamus virus, on the assumption that the viruses are free in the liquid and not attached to heterogeneous particulate matter. It is possible by the use of such membranes to separate a larger from a smaller virus when they occur in the mixed state.

69. K. M. SMITH, Cambridge.

The Plant Virus in the Insect Vector

Insect vectors of plant viruses may be of two types—the mechanical and the specific vector. Between these two extremes occur cases where a species–specificity of vector has given place to a group-specificity.

The two chief lines of inquiry on the relationship between the insect and the plant virus are concerned, firstly with the path followed by the virus in the insect and secondly with the reasons for this species- and group-specificity of vector.

There may be some close relationship between certain physical properties of a plant virus and its transmissibility by insects. Thus it may be that a high capacity for adsorption to certain substances by a virus is one reason for its transmissibility by insects.

Similarly the capacity of viruses to pass through certain membranes may be correlated with insect transmission. Some recent work on leafhoppers suggests a relationship between the permeability to viruses of the gut wall of the insect and its capacity to act as a vector.

ALPHABETICAL LIST OF SPEAKERS

LIST OF DEMONSTRATIONS

(In the Department of Pathology daily at 4.30 p.m., unless otherwise stated.)

E. Barta (Budapest). "Untersuchungen der lebenden Organe im durchfallenden Licht mit stärksten Vergrösserungen." Der Apparat heisst "Der Mikro-Illuminator."

J. Bland (London). (1) "Cultivation of a Protozöon (Toxoplasma) in Tissue Cultures." (2) "Stages in the Developmental Cycle of Psittacosis Virus in Tissue Cultures."

Department of Biochemistry. A demonstration of recent work will be given in the Sir William Dunn Institute of Biochemistry on Tuesday, August 22nd, from 5.0 p.m.—6.30 p.m.

J. Duyff (Amsterdam). (1) "Modified Carrel Flask." (2) "Some Modifications of the 'de Haan' Apparatus." (3) "Simple Apparatus for Gas Analysis in Tissue Cultures." (4) "The use of vital stain marks in Tissue Cultures." (5) "Methods for obtaining a series of Cultures of exactly the same form and dimensions."

Rh. Erdmann (Berlin). "Epithelgewebe mit der de Hannsche Durchströmungsmethode gezüchtet."

E. Fisher-Piette (Paris). "Proliferation *in vitro* dans le glande lymphatique des Crustacés."

H. S. Frenkel (Rotterdam). "A Method of Tissue Culture in Fluid Medium."

P. J. Gaillard (Leiden). "Differentiation *in vitro* from osteoblasts to Bone Substances."

A. Giroud (Paris). "Mise en evidence des substances à fonction SH."

E. Newton Harvey (Princeton). "Cytological Research with the Centrifuge Microscope."

J. C. Hill and J. Brontë Gatenby (Dublin). "Explants from *Helix aspersa* grown under non-aseptic conditions at room temperature."

M. J. Hogue (Philadelphia). "The Effect of certain Drugs on the Tissues of the Digestive Tract."

P. C. Koller and G. Pauling (Edinburgh). "The Effect of X-ray Treatment on Mitotic and Meiotic Division."

H. A. Königes (Budapest). "Contributions to the Cytology of Serous Membranes."

H. Laser (Heidelberg). "Methoden der Stoffwechselmessung von Gewebekulturen."

R. J. Ludford (London). "The Application of Vital Staining to the Study of Malignant Growths *in vitro*."

O. Mangold (Berlin). "Entwicklungmechanische Tafeln."

N. U. Meldrum and F. J. W. Roughton (Cambridge). "Demonstration of the Activity of Carbonic Anhydrase or CO_2 Catalyst in the Blood."

C. W. Metz (Baltimore). (1) "Chromosomal Differences between Germline and Soma in the Fly, *Sciara*." (2) "Method for study of Chromosomes in Entire Insect Eggs."

H. Pinkerton (Boston). "Histological Preparations showing the Intracellular Parasites of Typhus and Rocky Mountain Spotted Fever in Tissue Culture."

Murray, Cambridge. Fix. mit Methylalk. 5 min., Färben mit Sienna (1 Tr. auf 1ccm) über nacht. Aceton Differenzg.; Plasma blieb angefärbt

H. Pinkus (Breslau). "Oxyphane Granula in Gewebekulturen."

*E. K. Rideal (Cambridge). "Electrical Methods of determining the properties of Films including the attack of Protein Films by Enzymes."

This demonstration will be exhibited throughout the week in the Laboratory of Colloid Science, Free School Lane.

†R. N. Salaman (Cambridge). "Protective Inoculation against a Virus Disease in Plants."

Strangeways Research Laboratory (Cambridge). "Recent Work on Tissue Culture."

E. Tiedemann and B. Ephrussi (Paris). "Demonstration d'une nouvelle methode pour la mesure du metabolisme cellulaire."

J. André Thomas (Paris). "La culture pure du syncytium vitellin ombilical de l'embryon de Poulet. Etude histo-physiologique."

M. Volkonsky (Paris). "Phagocytosis in Protozoa, Sponges and Leucocytes."

J. Zweibaum (Warsaw). "La localisation de graisses dans les cellules cultivées *in vitro*."

LIST OF CINEMA FILMS

(In the Department of Physiology, Wednesday, August 23rd, 8.30 p.m., and Thursday, August 24th, 5.30 p.m.)

R. G. Canti (London) and H. B. Fell (Cambridge). "The Cultivation of Skeletal Tissue. The Development *in vitro* of the lower Limb-skeleton of the Embryonic Fowl."

R. Chambers (New York). "Some Features of Cell Permeability in Relation to Kidney Function."

E. Newton Harvey (Princeton). "Cytological Research with the Centrifuge Microscope."

W. H. Lewis and M. R. Lewis (Baltimore). "Motion Pictures of Dividing Rat Sarcoma Cells." (Demonstrated by G. L. Streeter.)

P. Mihalik (Budapest). "The Cultivation of Nervous Tissue."

H. Okkels (Copenhagen). "Cellular Structure and Cellular Function."

W. J. Pothoven and J. de Haan (Groningen). "Cinematograph Film of perfused Cultures." The film shows the successive changes which appear in perfused cultures of wandering cells.

H. Schade (Kiel). "Ueber eine physico-chemische Methode, die Gewebskultur ohne die bisher üblichen Zusätze durchzuführen."

F. W. L. Sheffield (Harpenden). "The Formation of an Intracellular Inclusion."

C. C. Speidel (Virginia). "Growth, Irritation and Repair of Nerves."

L. de Thanhoffer (Budapest). "The Structure of the Reticular Connective Tissue Cells as revealed by Micro-dissection."

* Professor Rideal will be present to demonstrate in person on Thursday and Friday, August 24th and 25th.

† Dr. Salaman will demonstrate in person (in the Department of Pathology) on Friday and Saturday, August 25th and 26th.

LIST OF MEMBERS OF CONGRESS

Adrian, E. D.	England
Andrewes, C. H.	,,
Annett, H. E.	,,
Baldes, E. J.	U.S.A.
Barnell, H. R.	England
Barta, E.	Hungary
Bayon, H. P.	England
Beauchamp, R. S. A.	,,
Beutner, R.	U.S.A.
Biedermann, W.	Switzerland
Blackman, F. F.	England
Bland, J.	,,
Bles, Mrs.	,,
Boldyreff, E. B.	U.S.A.
Brachet, J.	Belgium
Brooks, F. T.	England
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